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(54) METHOD FOR MANUFACTURE OF A DENTAL PRODUCT

METHODE ZUM HERSTELLEN EINES DENTALPRODUKTES

PROCEDE DE PREPARATION D'UN PRODUIT DENTAIRE

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(73) Proprietor: **Nobel Biocare AB (reg. no. 556002-0231)**
402 26 Göteborg (SE)

(72) Inventor: **PERSSON, Magnus**
S-462 61 Vänersborg (SE)

(74) Representative: **Olsson, Gunnar**
Nobel Biocare AB, Box 5190
402 26 Göteborg (SE)

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Description

TECHNICAL FIELD

[0001] The present invention relates to a method for manufacture of a dental product, or product which can be used in the human body, being designed with a sub-structure made of titanium or equivalent tissue-compatible material, which sub-structure is brought to a plasma application installation and when this one is activated one or more plasma layers are sprayed or applied on the sub-structure.

[0002] The description also gives an illustrative example of a device for facilitating the manufacture of a product which is made of titanium or equivalent tissue-compatible material and intended for dental and bodily purposes and comprising a support member for the product and a plasma application member for applying one or more plasma layers to the product. The description furthermore gives an example of a product for use in a dental or other bodily context. A possible example of a product is a dental cap. The product comprises a substructure which is made of titanium or another tissue-compatible material, on the surface of which one or more plasma layers are applied.

STATE OF THE ART

[0003] It is already known to use a transmission medium, for example the public telephone network, to transfer digital information on the construction of various dental products. With the aid of the information transfer, a dentist, dental technician, etc., can in this case request a machining site to produce a given dental product. It is thus already known to produce dental caps, dental bridge parts, etc., centrally, these being made of titanium or another tissue-compatible material. The production, which generally implies milling of titanium material, is relatively complicated and requires complex technology which may not be available to the particular client. The product in question can in this case be regarded as a semi-finished product and will be returned to the client for further handling. For example, the client will coat the product in question with a ceramic material which forms an onlay which corresponds to a tooth replacement or the like.

[0004] The information to the central machining site in this case consists of an information loop which can comprise machining data, address data for sender and recipient, desired delivery date, etc.

[0005] It is already known, in the case of implants which are intended to become incorporated in the dentine, to provide the implant with a thin plasma layer of ceramic material, which is intended to facilitate the incorporation of the implant into the dentine. It is thus already known to use plasma spray installations in conjunction with implants of this type.

[0006] It is also referred to EP-A-548365 which in general, discloses applying of plasma layer on an implant.

DESCRIPTION OF THE INVENTION

TECHNICAL PROBLEM

[0007] Applying ceramic onlay material onto a product sub-structure which has been produced in this way is a relatively complicated procedure. The application is effected in different layers. It is difficult to get the porcelain or the ceramic to attach to the titanium, among other reasons because it is necessary to work at relatively low temperatures. The invention aims to solve this problem and proposes a method allowing the application of the onlay material to be considerably simplified for the customer and client by the fact that the substructure is provided with plasma layer(-s) compatible with the substructure and the ceramic onlay material in an advantageus manner.

[0008] There is also a problem in achieving an aesthetic covering of the substructure when applying the pocelain. The titanium is dark and shows through the onlay material, especially if the latter is to be coated in a thin layer. The invention also solves this problem.

SOLUTION

[0009] The feature which can principally be regarded as being characteristic of the novel method is i.a. implémentation by an order or client site of data related to the manufacture of the product, i.a. data related to the application of said plasma layer(-s), in an information message which is to be sent in a tele-communications network, and transmitting from the order or client site of said information message on said tele-communications network to a production site connected to the network. The method also comprises extracting and identifying said information message on the production site, generating guidance coordinates and or guidance information to the plasma application installation by means of the information message received on the production site, and starting the activation of the plasma application installation by means of the guidance coordinates and/or guidance information and, then, causing the application or spraying directly on the substructure with the plasma layer or layers which is or are, respectively, chosen to be compatible both with the material of the substructure and a ceramic onlay material, for example pocelain, which is to be applied on said plasma layer or layers.

[0010] Further developments of the method are evident from the attached subclaims relating to the method.

[0011] The description gives illustrative examples of devices achieved by the inventive method.

[0012] The feature which can principally be regarded as characterizing a product produced by the method is that one or more ceramic onlays materials are applied on said plasma layer or plasma layers, and that the plasma layer or plasma layers is or are, respectively, com-

patible both with the material of the substructure and the ceramic onlay material or materials. In one embodiment, the plasma layer can have a thickness of approximately 200 micrometres. The plasma layer is applied on those parts which do not interact with the dentine or corresponding part of the human body.

ADVANTAGES

[0013] By means of what has been proposed above, controlled, thin plasma layers can be obtained on the respective product. The plasma layer material is preferably of a colour which does not show through the onlay material. The layer in question considerably facilitates the application of the onlay material. Equipment which is known per se can be used for the plasma layer application. The application of the plasma layer can take place at temperatures which are considerably higher than the fusion temperature or the phase transition temperature of the titanium. Plasma-sprayable ceramics which are known per se can be used on condition that they are compatible with the titanium material and with the onlay material. Aesthetically advantageous onlays can be obtained for or by the customer or the client in a much simpler way than has hitherto been possible. By means of the invention, the previous manual handling during the application of onlay material can be considerably reduced and simplified. Uncertainty in the application procedure can be eliminated. One advantage is that the plasma layer application takes place centrally, since expensive and relatively complicated equipment has to be used. It is also of advantage to arrange the application operation at a site where a large number of products can be processed.

DESCRIPTION OF THE FIGURES

[0014] A presently proposed embodiment of the method, device and product having the characteristic features of the invention will be described hereinbelow, at the same time with reference to the attached drawings in which:

Figure 1 shows, in diagram form, an information loop or an information packet relating to an order for production of an identified product,

Figure 2 shows, in block diagram form, information transfer via a telecommunications medium to a central unit which receives the production information and includes a station for milling of the product and a station for plasma layer application to the product or a part thereof,

Figure 3 shows, in a side view, parts of the plasma layer application equipment in conjunction with a product, in the form of a dental cap substructure, arranged on a rotating platform, and

Figure 4 shows a vertical cross-section of a product with onlay material applied.

DETAILED EMBODIMENT

[0015] In Figure 1, reference 1 shows an information loop which is made up of different parts A, B, C and D. The information contains data A on the addressee, for example a central production unit. Also included is data B on the client, the desired delivery date, etc. In accordance with the present invention, an information section C is also included, concerning whether the product or part thereof is to be coated with a plasma layer according to what is stated below. The data in space C can in this case include the thickness of the plasma layer, the colour of the plasma layer, the number of plasma layers, etc. There is also included, in a manner known per se, an information section D which includes production data for the product in question. The information can be digital and can consist of "ones" and "noughts" in a manner known per se.

[0016] According to Figure 2, a number of customers 2, 3 and 4 can use a telephone network, for example the public telephone network 5, to communicate with a producer 6 or production location. The telecommunications system can in this case operate with so-called packet transmission of a type known per se, in which information from each client is transported via combinable packets to the producer 6. The customers have, in a manner known per se, modems which are used during the transfer, and the production station or equivalent has members 7 which can extract and identify the information items from the customers 2, 3, 4 in a manner which is likewise known per se. In accordance with the concept of the invention, the production location can include one or more stations 8 for milling of products or product parts in a manner known per se. The information distinguished in the unit 7 is received in a unit 9 for generating guidance coordinates which are used in conjunction with the machining or production of the product. The machining and the manufacture of the product, for example a dental cap, can be carried out in a manner known per se and will therefore not be described in any detail here. According to the invention, the product or product part manufactured in each production station will be coated with a plasma layer, in accordance with what is stated below, if information C (see Figure 1) is present in connection with the order. The information according to C is distinguished in the unit 7 and is received in a unit 10 which generates guidance coordinates and/or guidance information for a plasma layer coating installation 11 which can be arranged in connection with the production station or the production stations 8 or can be separate from these. In Figure 2, the information concerning the actual production itself is indicated by i_1, while milling coordinates which have been compiled are represented by i_2. In a corresponding manner, the information C emanating from the unit 7 is indicated by i_3, while the ma-

chining function from the unit 10 has the designation i_4. The total information input to the production unit is indicated by i_5, which thus includes data according to A, B, C and D. Address information relating to the client is stored in a unit 12, and the address information is represented by i_6. Products manufactured in stations 8 and 11 are thus addressed in the unit 12. The products are then returned 13 to the clients 2, 3 and 4, or to the location specified by each client, for building up the products with onlay material. The order information from the clients is indicated by i_5', i_5'' and i_5'''.

[0017] Figure 3 shows equipment 14 for spraying on plasma layers. The equipment 14 can be of a type known per se and operates using the known plasma application principle. Starting material being sprayed on is indicated by 15. The product in question, which has been manufactured in accordance with the above at the station or stations 8, is set up on a support platform 16, for example a rotating platform. The platform 16 can be of the type which can be raised and lowered in the directions of the arrows 17 and 18. The longitudinal axis of the rotating platform is indicated by 19. The rotating platform can in this case be of the type where the platform is tiltable, i.e. the longitudinal axis 19 assumes different directions 19', 19", etc. The rotational movements of the platform are indicated by 20, 20' and 20", respectively. Alternatively, or in addition, the plasma spray device can be arranged in a fixed or movable manner. A bearing arrangement is indicated by 21, and a ceramic or powder container by 22. Tilting movements of the equipment are indicated by broken-line arrows 23. A product placed on the platform is shown by 24. The rotating platform can be rotated at a speed which can lie between 100 and 500 revolutions per minute. The plasma spray equipment can in this case operate with a material delivery 15 which gives one or more applied layers of 100 to 300, preferably approximately 200, micrometres in thickness. Rotations, upward and downward movements, and any movements of the assembly 14 can in this case take place simultaneously.

[0018] Figure 4 shows a tooth replacement or crown indicated by 25. The tooth replacement comprises a product 26 which is manufactured at the station or stations 8 in accordance with the above. The product or the substructure 26 has a spray-coated plasma layer 27 which has been shown in a greatly enlarged form for the sake of clarity. Onlay material 28 of a type known per se is applied on top of the layer. 27 represents a controlled layer of ceramic which is known per se, for example alumina. Alternatively, the layer can consist of a mixture of ceramics. The layer can be grey, for example, and covers the material surface/titanium surface of the substructure 26. The layer 27 has a coefficient of thermal expansion which is compatible both with the substructure material 26 and with the onlay material 28, which too can be made up of ceramics which are known per se. In addition to the fact that the application of the material 28 is considerably simplified, the dark surface of the substructure 26 is eliminated with the aid of the grey or differently coloured layer 27. The application of the layer 27 can take place at several hundred degrees or at a temperature considerably about the fusion temperature of the material/titanium of the substructure 26. In the spray installation, the material 27 is present in powder form, which can be purchased in the open market. The application thus takes place in a separate production stage. The plasma-sprayable ceramic is sprayed through a hot arc in a manner which is known per se.

[0019] Preferably, the equipment at the stations 8 and 11 is in the main completely automated.

[0020] The invention is not limited to the embodiment shown hereinabove by way of example, and can instead be subjected to modifications within the scope of the following patent claims.

Claims

1. Method for manufacture of a dental product (25), or a product which can be used in the human body, the method including the steps of designing a substructure (26) in titanium or equivalent tissue-compatible material, bringing the substructure to a plasma application installation (11) and activating this one for applying one or more plasma layers (27), compatible with the material of the substructure, on the substructure, and the step of applying a ceramic onlay (28), for example porcelain, on said plasma layer (s), **characterized in** generating a digitized information message (1) at an order-or client site (2, 3 or 4) by using first data (A) related to the addressee, second data (B) related to the order or client site, third data (C) related to said plasma layer(-s) and fourth data (D) related to the substructure, transmitting via a telecommunication system said digitized information message (1, i5) to a production site (6) which is providing a production station (8) for manufacture of the substructure (26) and providing said plasma application installation (11) and identifying, at the production site, from the transmitted digitized information, the third data and the fourth data and using the identified data (i1 and i3) to attain first guidance information (i2) to said production station (8) for the manufacturing of the substructure and second guidance information (i4) for the plasma application installation (11) for said application of the plasma layer(-s), carrying out said application at several hundred degrees or at a temperature considerably above the fusion temperature of the material of the substructure, and, by means of the second data (B) received at the production site, relating the semi-finished product, consisting of the substructure and its applied plasma layer(-s), to address information related to or specified by the order or client site and dispatching the semi-finished product from the production site for said application

of the ceramic onlay at the client site or a location specified by the order- or client site, and applying the ceramic onlay on the semi-finished product at relatively low temperature at the client site or said location.

2. Method according to Patent Claim 1 **characterized in** identifying the third and fourth data in a first unit (7), attaining the first and second guidance information (i2 and i4, respectively) by means of second and third units (9 and 10, respectively), and causing, by means the second guidance information, plasma layer(-s) with thickness of 100-300, preferably approximately 200. micrometers.

Patentansprüche

1. Verfahren zur Herstellung eines Dentalproduktes (25) oder eines im menschlichen Körper verwendbaren Produktes, mit den Verfahrensschritten des Ausbildens einer Substruktur (26) aus Titan oder ähnlichem gewebeverträglichem Material, Einbringen der Substruktur in eine Plasmabeschichtungseinrichtung (11) und Aktivieren der Einrichtung zum Aufbringen einer oder mehrerer Plasmaschichten (7), die mit dem Material der Substruktur kompatibel sind, auf der Substruktur, und dem Schritt des Aufbringens eines keramischen Onlays (28), zum Beispiel Porzellan, auf der (den) Plasmaschicht (en), **gekennzeichnet durch** das Erzeugen einer digitalisierten Informationsnachricht (1) an einem Auftrags- oder Klientenort (2, 3 oder 4) unter Verwendung empfängerbezogener erster Daten (A), auf den Auftrags- oder Klientenort bezogener zweiter Daten (B), auf die Plasmaschicht (EN) bezogener dritter Daten (C) und auf die Substruktur bezogener vierter Daten (D), Übertragung der digitalisierten Informationsnachricht (1, i5) über ein Telekommunikationssystem zu einem Produktionsort (6), an dem eine Produktionsstation (8) für die Herstellung der Substruktur (26) und die Plasmabeschichtungseinrichtung (11) vorhanden sind, und Identifizierung am Produktionsort der dritten Daten und vierten Daten aus der übertragenen digitalen Information und Verwendung der identifizierten Daten (i1 und i3) zur Erstellung einer ersten Führungsinformation (i2) für die Produktionsstation (8) für die Herstellung der Substruktur und einer zweiten Führungsinformation (i4) für die Plasmabeschichtungseinrichtung (11) für die Aufbringung der Plasmaschicht(en), Durchführung der Beschichtung bei mehreren 100° oder bei einer Temperatur deutlich oberhalb der Schmelztemperatur des Materials der Substruktur, und, mit Hilfe der am Produktionsort empfangenen zweiten Daten (B), Inbeziehungsetzen des fertigen Produktes aus der Substruktur und den aufgebrachten Plasmaschicht(en) mit Adresseninformationen, die sich auf den Auftrags- oder Klientenort beziehen oder von diesem spezifiziert werden, und Versenden des halbfertigen Produktes vom Produktionsort für die Anbringung des keramischen Onlays am Klientenort oder an einer von dem Auftrags- oder Klientenort spezifizierten Stelle, und Aufbringen des keramischen Onlays auf dem halbfertigen Produkt bei relativ niedriger Temperatur am Klientenort oder an der angegebenen Stelle.

2. Verfahren nach Anspruch 1, **gekennzeichnet durch** die Identifizierung der dritten und vierten Daten in einer ersten Einheit (7), Erstellen der ersten und zweiten Führungsinformation (i2 bzw. i4) mittels einer zweiten und dritten Einheit (9 bzw. 10) und Bewirken mittels der zweiten Führungsinformation eine Dicke der Plasmaschicht(en) von 100 bis 300, vorzugsweise annähernd 200 Mikrometer.

Revendications

1. Procédé de fabrication d'un produit dentaire (25), ou d'un produit qui peut être utilisé dans le corps humain, le procédé comportant les étapes consistant à concevoir une sous-structure (26) en titane ou un matériau équivalent compatible avec un tissu, amener la sous-structure dans une installation d'application de plasma (11) et activer celle-ci pour appliquer une ou plusieurs couches de plasma (27), compatibles avec le matériau de la sous-structure, sur la sous-structure, et l'étape consistant à appliquer une surcouche en céramique (28), par exemple de la porcelaine, sur ladite couche ou lesdites couches de plasma, **caractérisé par** la génération d'un message informationnel numérisé (1) au niveau d'un site de commande ou client (2, 3 ou 4) en utilisant des premières données (A) associées au destinataire, des deuxièmes données (B) associées au site de commande ou client, des troisièmes données (C) associées à ladite ou lesdites couches de plasma, et des quatrièmes données (D) associées à la sous-structure, la transmission via un système de télécommunications dudit message informationnel numérisé (1, i_5) vers un site de production (6) qui est muni d'une station de production (8) pour la fabrication de la sous-structure (26) et de ladite installation d'application de plasma (11) et l'identification, au niveau du site de production, à partir des informations numérisées transmises, des troisièmes données et des quatrièmes données et l'utilisation des données identifiées (i_1 et i_3) pour alimenter des premières informations de guidage (i_2) dans ladite station de production (8) pour la fabrication de la sous-structure et des secondes informations de guidage (i_4) pour l'installation d'application de plasma (11) pour ladite application de la cou-

che ou des couches de plasma, la mise en oeuvre de ladite application à plusieurs centaines de degrés ou à une température considérablement au-dessus de la température de fusion du matériau de la sous-structure, et, par l'intermédiaire des deuxièmes données (B) reçues au niveau du site de production, concernant le produit semi-fini, la réalisation de la sous-structure et de sa ou ses couches de plasma appliquées, pour adresser des informations associées au site de commande ou client, ou spécifiées par celui-ci, et l'envoi du produit semi-fini depuis le site de production pour ladite application de la surcouche en céramique au niveau du site client ou à un emplacement spécifié par le site de commande ou client, et l'application de la surcouche en céramique sur le produit semi-fini à une température relativement faible au niveau du site client ou dudit emplacement.

2. Procédé selon la revendication 1, **caractérisé par** l'identification des troisièmes et quatrièmes données dans une première unité (7), l'obtention des premières et secondes informations (i_2 et i_4, respectivement) par l'intermédiaire de deuxième et troisième unités (9 et 10, respectivement), et la réalisation, par l'intermédiaire des secondes informations de guidage, d'une ou de plusieurs couches de plasma ayant une épaisseur de 100 à 300, de préférence approximativement 200, micromètres.

Fig. 1

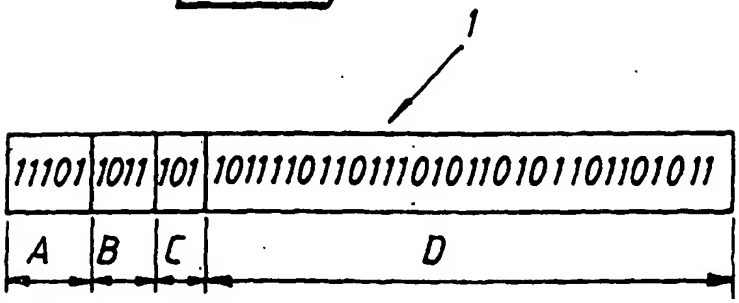
1
11101
1011
101
10111101101110101101011011010 11
A
B
C
D

Fig. 2

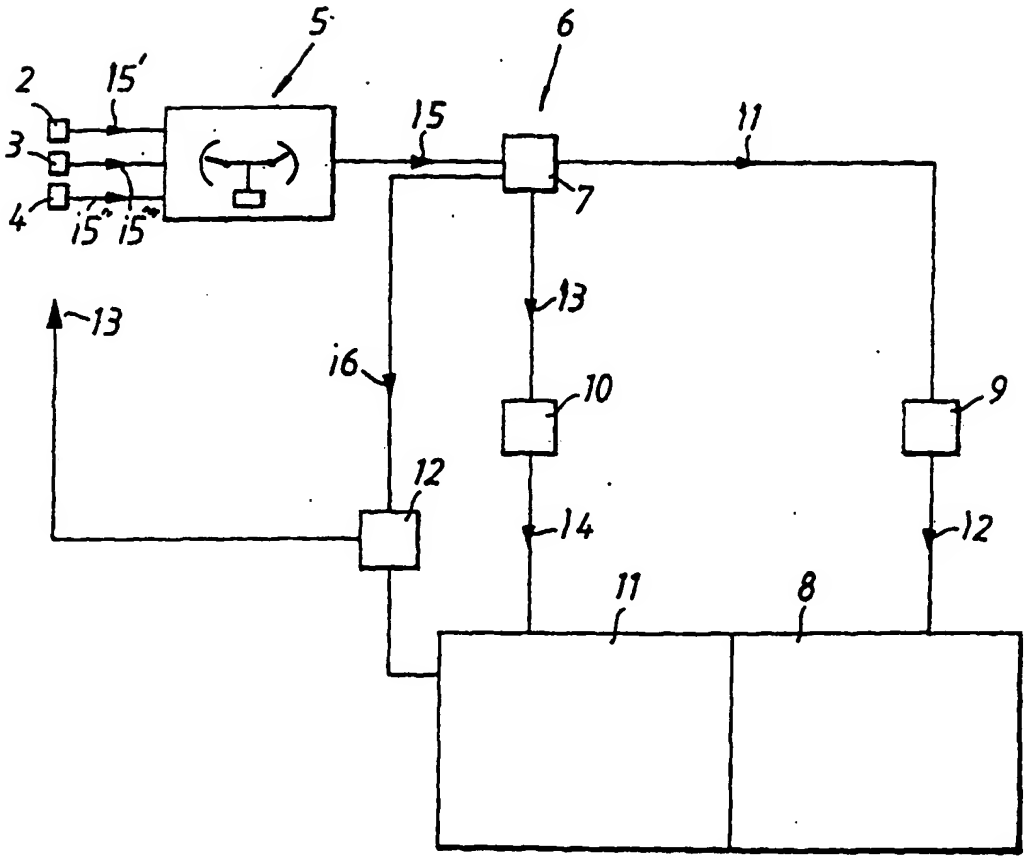
5
6
2
15'
3
4
15
11
7
15"
15"
13
13
16
10
9
12
12
14
11
8

Fig. 3

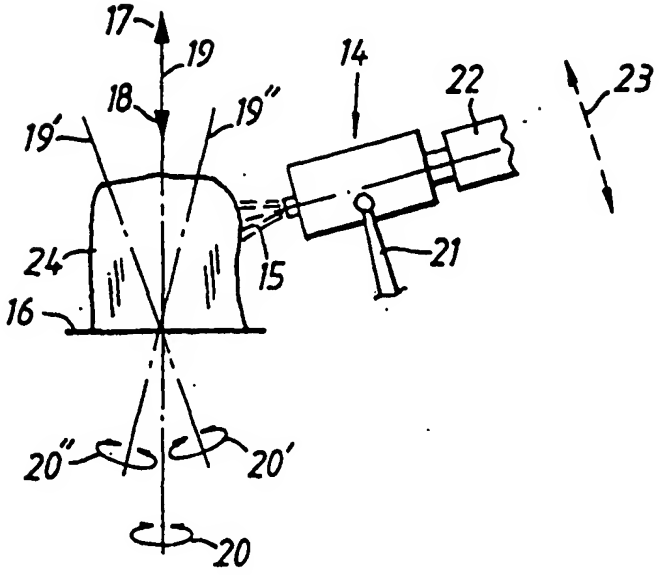

Fig. 4